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Legislative Hearing of the House Subcommittee
on the Federal Workforce and Agency Organization

"Real Estate Investment Trusts (REITs):
Can They Improve the Thrift Savings Plan?"

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Rayburn House Office Building
Room 2154

I. Introduction

Ibbotson Associates Inc., an investment research firm based in Chicago, Illinois, entered into an agreement with The National Association of Real Estate Investment Trusts® (NAREIT) to provide an updated presentation on the contribution of REIT stocks to portfolio performance for Federal Thrift Savings Plan beneficiaries. The study conducted by Ibbotson Associates sets out to assess what type of impact the addition of a REIT fund would have on historical portfolio performance when added to a portfolio comprised of the current five funds offered through the Federal Thrift Savings Plan. The goal was to determine if a REIT fund would offer participants of the Federal Thrift Savings Plan certain benefits not available through the plan's current investment options.

II. Executive Summary

- REITs have had higher historical returns over the period 1988 to 2004 compared to broad indexes of stocks and bonds.
- REITs provide excellent diversification benefits to stock and bond portfolios.
- A REIT fund would enhance the risk/return tradeoff of the G, F, C, S, and I Funds.

III. Federal Thrift Savings Plan Investment Funds

Three of the five current investment funds in the Federal Thrift Savings Plan contain total return data dating back to January 1988. These funds consist of the G Fund (government securities investment fund), F Fund (fixed income index investment fund), and C Fund (common stock index investment fund). This historical data was used throughout the presentation. Two of the remaining funds contain data dating back to May 2001. These funds consist of the S Fund (small capitalization stock index fund) and the I Fund (international stock index investment fund). In order to create the common starting date of January 1988 amongst all five funds, Ibbotson Associates backfilled the data of the S and I Funds using appropriate investment indexes as benchmarks. Since the objective of the S Fund is to match the performance of the Dow Jones Wilshire 4500 Index, a broad market index made up of stocks of U.S. companies not included in the S&P 500, Ibbotson utilized data on this index to backfill data to January 1988. The objective of the I Fund is to match the performance of the Morgan Stanley Capital International EAFE (Europe, Australasia, Far East) Index, a broad international market index, made up of stocks of companies in 21 developed countries. Ibbotson Associates utilized data on this index to backfill data for the I Fund to January 1988. For the period in which backfilled data was utilized, annual expense ratios were set equal to those of the C Fund. The R Fund (REIT fund) is represented by the NAREIT (The National Association of Real Estate Investment Trusts) Equity REIT Index. Annual expense ratios were calculated to be twice those of the C Fund's annual expense ratios.

Table 1 presents summary statistics of annual total returns for the five current investment funds as well as the R Fund. The summary statistics presented are geometric return (compound return), arithmetic return (average return), and standard deviation (risk). From the table it is quite apparent that the R Fund has provided the highest level of return among all of the funds presented over the period 1988 to 2004. In addition to offering a higher total return than the other stock funds, the C, S, and I Funds, it has done so with a lower standard deviation. Table 2 presents the annual cross-correlations for the five current investment funds as well as the R Fund. The cross-correlation between two funds measures the extent to which they move in relation to one another. Correlation coefficients range from negative 1 (as one fund moves in either direction, the fund that is perfectly negatively correlated will move by an equal amount in the opposite direction) to positive 1 (implies that as one fund moves, either up or down, the other fund will move in the same direction). Mean-variance optimization tends to favor investments with low to moderate correlation coefficients.

IV. Building Efficient Investment Portfolios

A majority of the analysis throughout the presentation is based on the concept of mean variance optimization pioneered by Harry M. Markowitz. Mean-variance optimization is the process of identifying portfolios, or groups of assets, that have the highest possible return for a given level of risk or the lowest possible risk for a given level of return. Such a portfolio is considered "efficient," and the locus of all efficient portfolios is called the efficient frontier. The historical investment period utilized in the analysis is from 1988 to 2004. Optimal portfolios using the current investment funds of the Federal Thrift Savings Plan were determined. Once this analysis had been conducted, diversification benefits of adding a REIT index fund were established.

Based on the fact that the Thrift Savings Plan is a long-term savings and investment plan designed to provide retirement income, maximizing investment performance is critical to achieving financial security for plan participants. Diversification of investments is central to the modern understanding of prudence in risk bearing and maximization of portfolio performance. Each type of asset produces investment returns having a unique set of investment attributes: rate of return, volatility of returns, and correlation of returns. When the rate of return is sufficiently high, the volatility of returns sufficiently low, and/or the pattern of returns sufficiently different, the investment can earn a place in the optimal portfolio.

V. Optimal Investment Allocations

Mean-variance optimization was employed to determine optimal portfolio allocations made up of the plan's five current investment options (G, F, C, S, and I Funds). Historical data for the period January 1988 to December 2004 was used in the optimization process (please refer to Tables 1 and 2 for a summary of the data used in the optimization process). An efficient frontier was created that consisted of 100 optimal portfolios that historically provided the highest expected return possible for their respective risk levels. Figure 1 graphically depicts the optimal investment allocations with the current five funds. At low levels of standard deviation, or risk,

portfolios favor the G Fund due primarily to its low level of risk. As the risk level increases, the G fund falls out of favor and is replaced by the F and C Funds, with a smaller percentage allocated to the S Fund. At the highest risk and return levels, portfolios are heavily weighted towards the S Fund due to its corresponding high level of risk and return.

Next, mean-variance optimization was employed to determine what percentage of the plan's five current investment options, as well as the R Fund, make up optimal portfolio allocations. Once again historical data for the period January 1988 to December 2004 was used in the optimization process (please refer to Tables 1 and 2 for a summary of the data used in the optimization process). An efficient frontier was created and Figure 2 graphically depicts the optimal investment allocations with the current five funds as well as the R Fund. At low levels of standard deviation, or risk, portfolios favor the G Fund due to the low level of risk associated with the fund. As the risk level increases, the G fund falls out of favor and is replaced by combinations of the F, C, and R Funds. At the highest risk and return levels, portfolios are heavily weighted towards the R Fund due to its corresponding high level of risk and return. The R Fund appears in all of the optimal portfolios created—from those with the lowest risk and return parameters to those with the highest, with the percentage allocated to the R Fund increasing as the level of risk and corresponding return increases.

REITs have historically provided portfolio diversification benefits typical of commercial real estate investments. REITs increase returns and reduce risk when added to an optimum portfolio of G, F, C, S, and I Funds. Optimum portfolios included an appreciable allocation to REIT stocks across most levels of portfolio risk. This is primarily due to the fact that the R Fund has provided a higher total return than the C, S, and I Funds and has done so with less risk. Also, the correlation between the R Fund and the C, S, and I Funds has been low to moderate. Please refer to Tables 1 and 2 for the actual figures.

VI. Alternative REIT Benchmark Analysis

As an additional basis for comparison with the original R Fund analysis, an alternative REIT benchmark was considered. We constructed an equal-weighted portfolio of all available real estate mutual funds, based on the Thomson Financial fund database for the period of the original analysis. In other words, a portfolio of all available underlying REITs and real estate stocks, with weightings averaged across those selected by all fund managers, and expenses averaged across all investable funds, was developed.

Table 3 presents summary statistics of annual total returns for the original R Fund as well as the alternative R Fund constructed in the aforementioned manner. The summary statistics presented are geometric return (compound return), arithmetic return (average return), and standard deviation (risk). As the table clearly illustrates, the risk and return of the alternative R Fund are almost identical to those of the original R Fund. Figure 3 graphically depicts the optimal investment allocations with the current five funds as well as the alternative R Fund. The graph illustrates results that are very similar to the results presented in Figure 2. This makes sense due to the similarity of risk and return attributes between the alternative and original R Funds. These results suggest that the original R Fund, represented by the NAREIT Equity REIT

Index, is a reasonable proxy for the average investable real estate fund actually available to investors over the time period analyzed.

VII. Sensitivity Analysis

In the original analysis a percentage of the R Fund is present in each optimal portfolio and becomes the dominant fund with increasing risk tolerance. The analysis was conducted based on historical data and it should not be assumed that the results will hold true going forward. The risk and return parameters of the R Fund, as well as its correlation with the other funds, will change. Since we do not know in which direction these changes will take place, we were motivated to conduct a sensitivity analysis.

The risk, return, and correlation of the R Fund were modified in a series of "what if" scenarios to demonstrate the potential benefit of REITs during different possible future conditions. Rather than arbitrarily making adjustments to the R Fund's return, risk, and correlation, we decided to make them in relation to the C Fund. The objective of the C Fund is to match the performance of the S&P 500 Index, a broad market index made up of stocks of 500 large- to medium-size U.S. companies. Figure 1 illustrates that before the R Fund was introduced into the optimization process, the C Fund clearly dominated. Our intention with the sensitivity analysis was to make our adjustments relative to the C Fund in order to determine if and when the C Fund's dominance reemerges.

Table 4 shows the original optimization inputs as well as the adjustments based on a scenario that involved decreasing the R Fund's return, with volatility and correlations remaining at historical levels. Figure 4 graphically depicts the optimal investment allocations with the current five funds (noted as the original case) as well as the optimal investment allocations after the adjustments discussed above were applied. Decreasing the R Fund's return restores the dominance of the C Fund for optimal portfolios with moderate to aggressive risk tolerance, with some allocation to the R Fund remaining appropriate until the S Fund dominates for the highest levels of risk. However, it is important to note that even after the return adjustments were applied, the R Fund appeared in 88% of the optimal portfolios. When other scenarios were also examined, it was clear that the historical investment characteristics of REITs make real estate an appropriate addition to a diversified portfolio of equity and fixed income assets, for a very wide range of investor risk tolerance and for a substantial range of unfavorable adjustments to historical return, volatility, and correlation.[1]

[1] Other scenarios explored included: 1) Increasing R Fund volatility, with return and correlations remaining at historical levels, 2) Increasing correlation between the R Fund and C Fund, with return and volatility remaining at historical levels, 3) Decreasing R Fund return and volatility, with correlations remaining at historical levels, and 4) Decreasing R Fund return, increasing R Fund volatility, and increasing correlation with the C Fund.

VIII. Conclusion

Our analysis has served to show that a REIT index fund increased returns and lowered risk when added to portfolios of G, F, C, S and I investment funds. These results are mainly due to the historical diversification benefits that a REIT fund had to offer over the time period analyzed. As an additional basis for comparison with the original R Fund analysis, which utilized the NAREIT Equity REIT Index, an alternative REIT benchmark was considered. The results using the alternative REIT benchmark were very similar to the results conducted using the NAREIT index. Lastly, after a series of "what if" scenarios were conducted in which the return of the REIT fund was lowered, the R Fund was still an appropriate addition to a diversified portfolio of equity and fixed income assets In conclusion, it has been determined that a REIT index fund would make available to Federal Thrift Savings Plan participants certain diversification benefits not currently available from the G, F, C, S, and I investment funds.

Tables and Figures:

Table 1: Risk and Return Attributes
1988 to 2004

	Compound Annual Total Return (%)	Average Annual Total Return (%)	Standard Deviation of Annual Total Returns (%)
G Fund	6.6	6.6	1.5
F Fund	7.9	8.1	5.4
C Fund	12.3	13.7	17.8
S Fund	12.1	13.8	19.9
I Fund	5.7	7.4	19.3
R Fund	12.7	14.0	16.6

Table 2: Correlation of Annual Total Returns
1988 to 2004

	R Fund	G Fund	F Fund	C Fund	S Fund	I Fund
R Fund	1.00	-0.25	0.14	0.21	0.41	0.23
G Fund	-0.25	1.00	0.29	0.20	0.02	-0.19
F Fund	0.14	0.29	1.00	0.21	0.09	-0.21
C Fund	0.21	0.20	0.21	1.00	0.88	0.64
S Fund	0.41	0.02	0.09	0.88	1.00	0.74
I Fund	0.23	-0.19	-0.21	0.64	0.74	1.00

Table 3: Performance of Alternative REIT Benchmark Measures
1988 to 2004

	Compound Annual Total Return (%)	Average Annual Total Return (%)	Standard Deviation of Annual Total Returns (%)
Original R Fund	12.75	13.96	16.63
Alternative R Fund	12.91	14.01	15.95

Table 4: Optimization Inputs Utilized for Sensitivity Analysis in Figure 4 Assuming Lower R Fund Returns
1988 to 2004

	Average Annual Total Return (%)	Standard Deviation of Annual Total Returns (%)	Correlation with C Fund
Original Case (R Fund return set equal to historical R fund return)	13.96	16.63	0.21
Case 1 (R Fund return assumed to be 90% of C Fund return)	12.36	16.63	0.21
Case 2 (R Fund return assumed to be 80% of C Fund return)	10.99	16.63	0.21
Case 3 (R Fund return assumed to be 70% of C Fund return)	9.62	16.63	0.21

Figure 1: Optimal Investment Allocations with Current 5 Funds Based on Historical Data over the Time Period 1988 to 2004

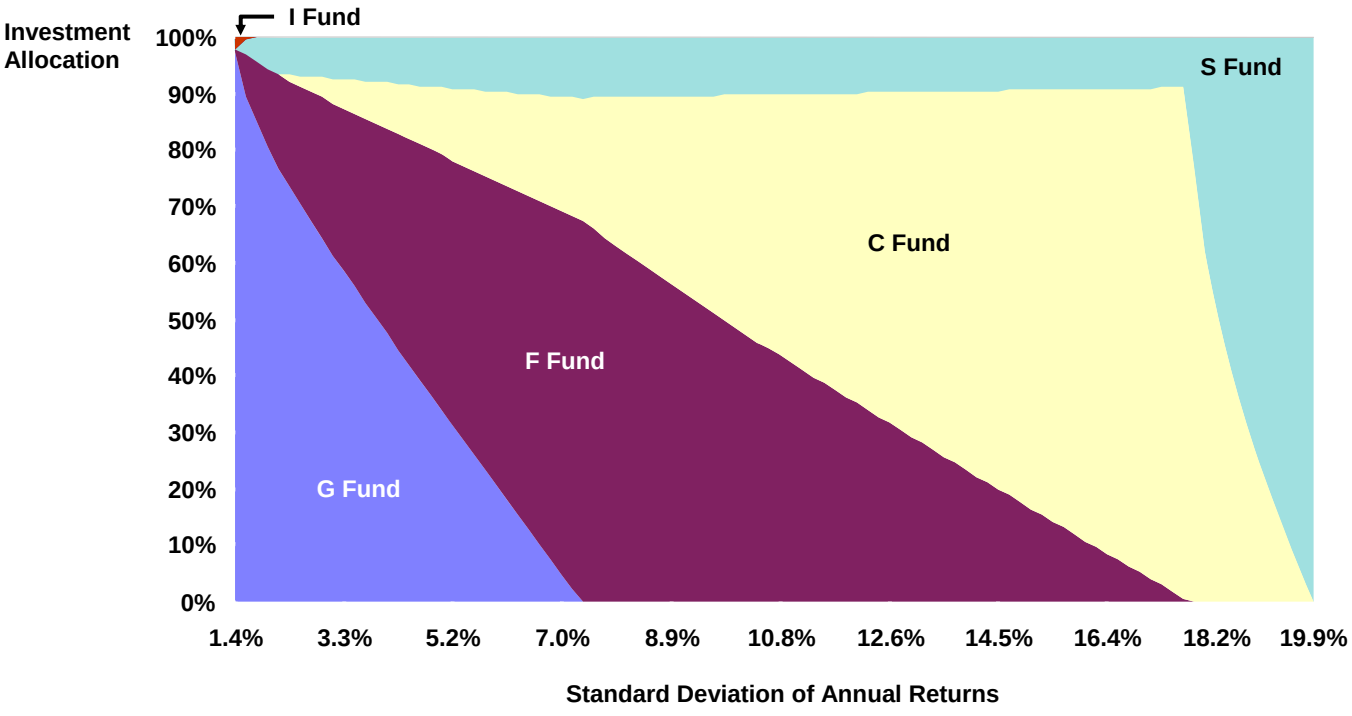

Figure 2: Optimal Investment Allocations with Current 5 Funds and R Fund Based on Historical Data over the Time Period 1988 to 2004

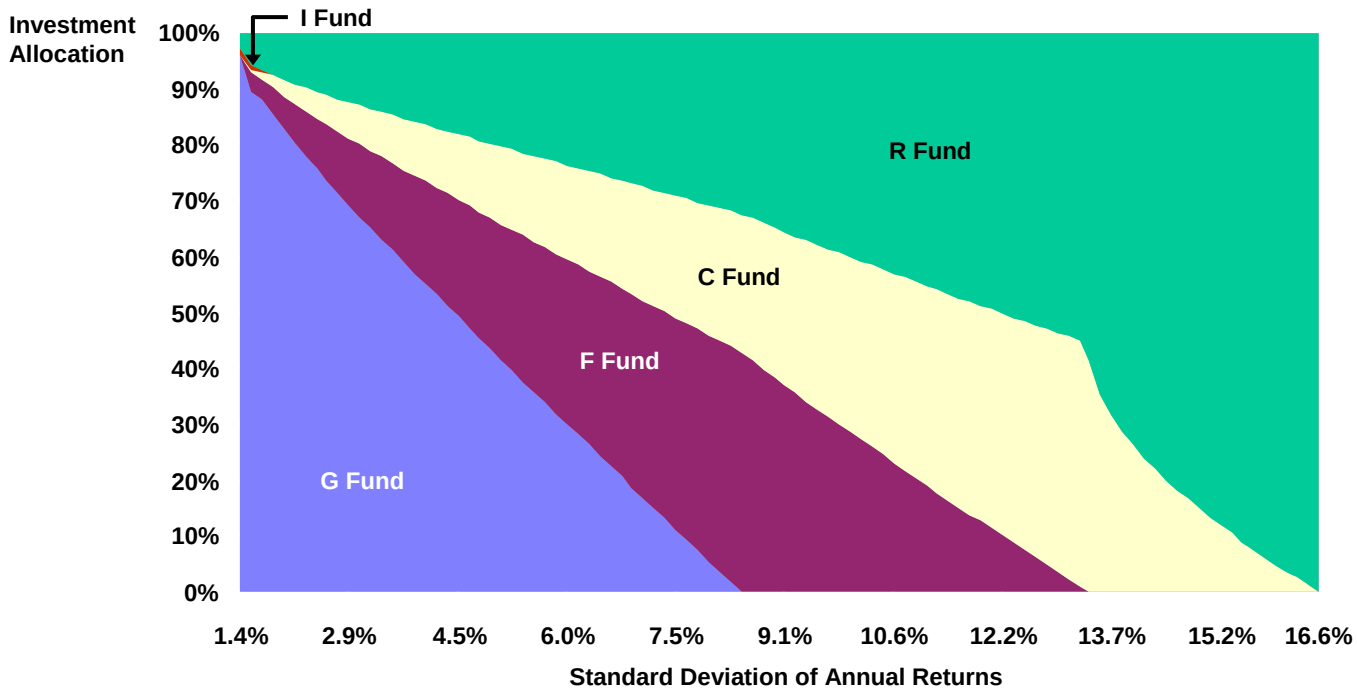

Figure 3: Optimal Investment Allocations Using Alternative REIT Benchmark Based on Historical Data over the Time Period 1988 to 2004

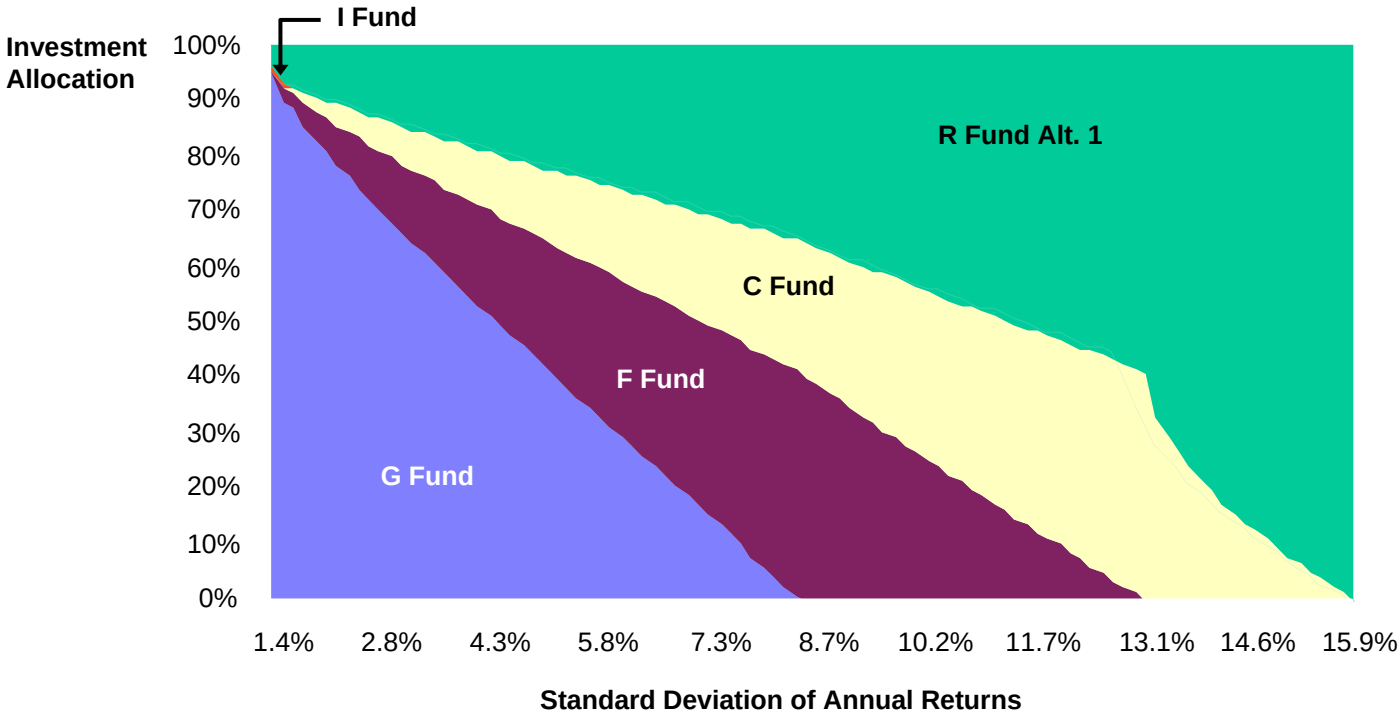

Figure 4: Optimal Investment Allocations Utilizing Sensitivity Analysis Based on Historical Data over the Time Period 1988 to 2004 but Using Assumed Lower R Fund Returns